ABSTRACT

The invention relates to methods and apparatus for mixing a plurality of gases. The preferred embodiments of the invention comprise forming bubbles of at least two gases injected separately into a liquid, and passing said bubbles through a gas-induced turbulent liquid region to enhance gas transfer between bubbles and to thereby mix the at least two gases. Creating the gas-induced turbulent liquid region preferably includes using a high gas superficial velocity, and may further include using powered mechanical devices, static internal structures, fluid recirculation, or combinations thereof. The gas mixture is preferably supplied to a reaction zone. In one embodiment a bubble tank mixer supplies a gas mixture comprising oxygen and a hydrocarbon gas to an oxidation reaction zone disposed above said mixer. In alternative embodiments the reaction zone and mixer may be integrated into the same vessel.